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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/856,422	12/13/2001	Zvi Kam	U013475-2	7739
140	7590	10/18/2004	EXAMINER WERNER, BRIAN P	
LADAS & PARRY 26 WEST 61ST STREET NEW YORK, NY 10023			ART UNIT 2621	PAPER NUMBER 11

DATE MAILED: 10/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/856,422

Applicant(s)

KAM, ZVI

Examiner

Brian P. Werner

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 34,35 and 38-41 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 34,35 and 38-41 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 5 & 10.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Priority***

1. This application is a national stage application of PCT/IL99/00645 filed on November 30, 1999, which claims priority to Israel application 127359, filed on December 1, 1998.

### ***Response to Amendment***

2. The following Office Action is responsive to the preliminary amendment received on February 18, 2004. Claims 34, 35 and 38-41 are now pending.

### ***Drawings***

3. Figure 1B should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). This drawing is described as "prior art" at specification page 10, line 5. Figure 6 is labeled "prior art". However, this figures appears to be part the disclosed invention and not a prior art depiction. The "prior art" label should be removed if this is the case. In figure 2, it appears that filter wheel "27" should actually be labeled "12" in accordance with specification page 11, bottom line.

Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.121(d)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant

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will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 38 and 39 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 38, which is representative of claim 39, will be exemplified.

Claim 38 requires:

an adaptive optics controller to control and adaptive optical element in a confocal microscope to correct aberrations resulting from variations in the refractive index at a multiplicity of locations in a medium; where

the adaptive optics controller uses an aberrated wavefront determined by the ray tracer.

The entirety of the specification is directed to correcting aberrations resulting from refractive index variations using image processing. For example, refer to figure 2, numeral 34, figure 3, numeral 54 and figure 7. That is, in order to correct the aberrations, a location

dependent point spread function is convoluted with an observed image as depicted at figure 3, numeral 54. This is a mathematical manipulation and reconstruction.

However, claim 38 requires a physical, or optical element to be placed in the optical path of a confocal microscope which is adaptive and responsive to the aberrated wavefront (presumably as determined using image processing techniques) to perform the deconvolution step at figure 3, numeral 54. The optical element that performs this deconvolution is not sufficiently described by the specification to enable one skilled in the art to make and use the invention without undue experimentation.

The only description of this embodiment in the specification is at page 9, in the summary section. Essentially, page 9 describes "an adaptive optical element" in the same manner as claimed. Also, page 9 states, "... a method for adding (computationally or physically) in the imaging path a three-dimensional medium (anti-sample) with refractive properties that correct for the distortions of the three-dimensional sample." However, the specification fails to describe what an "anti-sample" is, what it is constructed of, how it works, etc. Because this appears to be a critical aspect of the invention which is necessary for one to make and use the invention, and because there are no known examples of such an anti-sample in the prior art that are "adaptive", and in a confocal microscope, to correct aberrations resulting from variations in the refractive index at a multiplicity of locations in a medium, one skill in the art would require more information. What is the adaptive optical element, how it is make, how does it work, how does it adapt itself, how does change itself to correct for refractive index variations in a sample, etc.? At least some of this information would be required for one skill in the art to make and use the

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invention without undue experimentation. Without any know prior art to start with, one skill in the art would be starting with the suggestions at specification page 9, which is insufficient.

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless —

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 34 and 35 are rejected under 35 U.S.C. 102(b) as being anticipated by Berger et al. (article titled "Ray Tracing"; IEEE Computer Graphics & Applications).

Berger discloses a computer implemented method comprising:

determining local variation of the refractive index at a multiplicity of locations in a medium ("refractive index squared is a linear function of the altitude within a layer of air at constant pressure" at page 37, right column); and

analytically determining the path of a ray through the multiplicity of locations in the medium, for a plurality of rays impinging thereon in different directions ("as the ray enters the mirage box, it strikes the different air layers, bending at each level and thereby approximating the parabolic ray equation" at page 8, right column; see figures 3-5).

8. Claims 34 and 35 are rejected under 35 U.S.C. 102(b) as being anticipated by Stam et al. (article titled "Ray Tracing in Non-Constant Media"; Proceeding of the 7<sup>th</sup> Eurographics Workshop on Rendering).

Stam discloses a computer implemented method comprising:  
determining local variation of the refractive index at a multiplicity of locations in a medium ("a model of the refractive index" at section 4, first sentence); and  
analytically determining the path of a ray through the multiplicity of locations in the medium, for a plurality of rays impinging thereon in different directions (section 5, "ray tracing algorithm, first paragraph; see "for each ray in the trace ...").

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 40, which is representative of claim 41, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Goldstein (US 4,827,125 A) and Chan et al. (US 6,275,726 B1).

Goldstein discloses providing a confocal microscope (figure 1; "confocal ... microscope" at column 4, line 37) having an imaging path between a three-dimensional sample (figure 1, numeral 27; "specimen" at column 8, line 6) and its output image plane (figure 1, numeral 35).

Goldstein does not teach:

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determining variations of the refractive index in said three-dimensional sample; and  
disposing in said imaging path a three-dimensional medium having properties that correct aberrations resulting from said variations of the refractive index in the three-dimensional sample.

Chan teaches imaging a specimen with a confocal microscope (“confocal” at column 2, line 30 and “confocal microscopy” at column 8, line 58), comprising:

determining variations of the refractive index in said three-dimensional sample (“highly light scattering because of the refractive index (n) variations among water and various inter/intra cellular components ...” at column 1, lines 25-35); and

disposing in said imaging path a three-dimensional medium (“index matching the cellular components” at column 2, line 37; “replacing inter and/or intrastitial (extracellular) fluid with another (replacement) fluid that has a refractive index more similar to that of the inter/intra cellular components” at column 2, lines 63-66) having properties that correct aberrations resulting from said variations of the refractive index in the three-dimensional sample (“enhancing the visualization of turbid biological tissue comprising the reduction of light reflection and refraction” at column 3, lines 29-31; “improves the imaging of tissues” and “improve the depth of penetration and increases signal to noise values” at column 8, lines 55-57).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to dispose the index matching fluid of Chan into the specimen of Goldstein, in order to enhance “the visualization of turbid biological tissue comprising the reduction of light reflection and refraction” (Chan at column 3, lines 29-31), thereby improving “the imaging of tissues” and “the depth of penetration” and increasing “signal to noise values” (Chan at column 8, lines 55-57).



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*Conclusion*

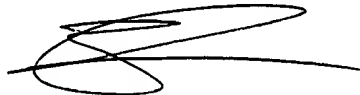
11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Smith (US 4,947,323 A) is pertinent as teaching deblurring an image (figure 1). Sapia et al. (US 6,166,853 A) is pertinent as teaching 3D deconvolution of microscope images (abstract).

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian P. Werner whose telephone number is 703-306-3037. The examiner can normally be reached on M-F, 8:00 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Brian Werner  
Primary Examiner  
Art Unit 2621  
October 14, 2004



**BRIAN WERNER**  
**PRIMARY EXAMINER**